IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Charles M. Lieber et al.
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For:	NANOSCOPIC WIRED-BASED DEVICES AND ARRAYS
Examiner:	Howard Weiss
Art Unit:	2814

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I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the U.S. Postal Service on the date shown below with sufficient postage as First Class Mail, in an envelope addressed to: MAIL STOP AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Dated: 4/4/07

Signature: Angela M. Griffith

PRE-APPEAL BRIEF REQUEST FOR REVIEW

In response to the Final Office Action mailed October 13, 2006, Applicants hereby request Panel Review. Claims 1, 3, 5, 7-10, 13, 14, 16-18, 20-23, 56-59, 90-104, 107-112, and 114-117 are pending for examination.

Rejections under 35 U.S.C. §103(a)

Claims 1, 3, 5, 7-10, 13, 14, 16-18, 20-23, 56-59, 90-104, 107-112, and 114-117 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Melzner, *et al.*, U.S. Patent No. 5,774,414 ("Melzner") and Brandes, *et al.*, U.S. Patent No. 6,445,006 ("Brandes").

Legal Deficiencies: Applicants respectfully submit that the Examiner has not provided a proper teaching, suggestion, or motivation to make the combination of Melzner and Brandes. Specifically, the Examiner has repeatedly stated that the motivation to make the combination of Melzner and Brandes is to "capitalize on the semiconducting properties of carbon nanotubes." See, e.g., the Office Action of October 13, 2006, ¶3; the Office Action of February 21, 2006, ¶6; or the Office Action mailed July 26, 2005, ¶4; see also the Office Action mailed November 19, 2004, ¶10 (same rationale, but difference references). A statement "to capitalize on the semiconducting properties of carbon nanotubes" is not legally sufficient to provide a *prima facie* case of obviousness in combining Melzner with Brandes. One of ordinary skill in the art, in examining Melzner, directed to a semiconductor memory device, would not be motivated to locate Brandes, directed to carbon-based nanotube sensors, and make their combination, and

there does not seem to be any logical relationship between a memory device and a sensor. In particular, Melzner nowhere discloses a "nanotube," let alone a "carbon nanotube." Accordingly, the statements by the Examiner alleging that Melzner could be modified in such a way as to "capitalize on the semiconducting properties of carbon nanotubes" is mere speculation on the part of the Examiner, and finds no objective support in the teachings of Melzner.

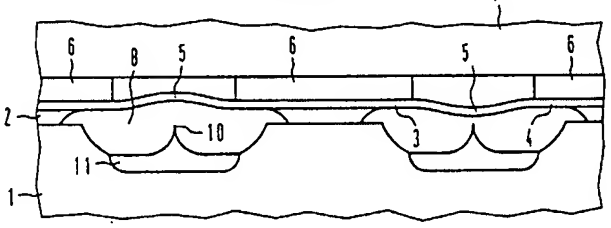
Moreover, the term "capitalize" is vague and general, and could mean any number of different things. For example, one of ordinary skill in the art, in attempting to "capitalize" on the semiconductor properties of carbon nanotubes, may be motivated to produce shorter carbon nanotubes or larger carbon nanotubes. Or, perhaps the person of ordinary skill in the art would look for ways to decrease the costs of manufacturing or selling such nanowires. The Examiner has provided no rational explanation, beyond mere "capitalization," as to why a person of ordinary skill in the art, in reading Melzner (which does not even disclose or suggest a carbon nanotube), would be motivated to modify Melzner in such a way as to incorporate the teachings of Brandes, and has pointed to no statement in Melzner that would support such a modification.

It appears that the Examiner has taken the phrase "to capitalize on the semiconducting properties of carbon nanotubes" from Brandes. See, col. 7, line 67 to col. 8, line 2. However, using *Melzner* as the primary reference, the Examiner cannot point to a statement in *Brandes* to provide the motivation to combine them. Such an approach is a classic hindsight combination: (1) combine a first reference with a second reference, then (2) identify a statement in the second reference that justifies finding it in the first place. This approach is impermissible. To provide a proper *prima facie* case of obviousness, the Patent Office must provide a reasoned, objective teaching, suggestion, or motivation as to why one of ordinary skill in the art would make the combination proposed. Applicants submit that the statement "to capitalize on the semiconducting properties of carbon nanotubes" does not meet this requirement.

Factual Deficiencies: Even if, *arguendo*, one of ordinary skill in the art is motivated to make the combination of Melzner with Brandes, it is not seen how this combination could physically be formed. In Melzner, the relative positions of a series of diaphragms (circular discs) are used to establish a pattern of electrical connections to store data. The diaphragms are under internal compressive stresses such that they are always in a "concave up" or a "concave down" position. This is similar in concept to a toy bimetallic or "jumping" disk, which is made of two

metals (e.g., brass and iron) that expand and contract at different rates: when heated (e.g., by holding it in one's hand), the disk is concave down, but when it cools (causing differential contraction of the disk), it snaps into its concave up shape, which can be used to propel it off of a table. The diaphragms of Melzner appear to operate under a similar principle. In one state, diaphragm 5 is in a "concave up" state and thereby contacts a "sharp point" 10 just below the diaphragm (see Fig. 2G, reproduced below, right diaphragm); in the other state, the diaphragm is in a "concave down" state and does not contact the "sharp point" (Fig. 2G, left diaphragm). The diaphragms can be flipped from one state to the other using, e.g., pneumatic forces (col. 2, lines 60-67), for example, by heating a gas with a laser to a few hundred degrees Celsius, to increase the pressure by one atmosphere (col. 3, lines 1-3).

FIG 2G



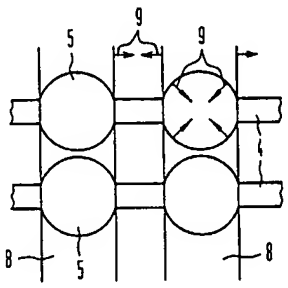
Brandes, on the other hand, is directed to the use of carbon nanotubes as sensors. Initially, it is not clear from the prior art replied upon that a carbon nanotube could be moved using the pneumatic forces utilized by Melzner in an embodiment of his switching protocol. It should be noted that the scale of the device in Brandes is several orders of magnitude smaller than in Melzner. With such differences in scale, one of ordinary skill in the art would not expect that the nanotubes of Brandes would move under the influence of pneumatic forces in the same way that the diaphragms of Melzner move. It is well-known that physical forces on the macroscale, and even on the microscale, do not readily translate to equivalent forces on the nanoscale. Accordingly, there is no reasonable expectation of success that the pneumatic forces described in Melzner could be used to move the carbon nanotubes of Brandes.

In addition, it is not clear which component of Melzner would be substituted with a carbon nanotube of Brandes. As discussed above, the Examiner has stated that such a substitution could be made to "capitalize on the semiconducting properties of carbon nanotubes," but has provided no explanation as to what substitutions could be made (let alone why one of

ordinary skill in the art would choose to make such a substitution), despite Applicants' repeated requests. See, e.g., the Response filed August 7, 2006, page 10, or the Response filed December 20, 2005, page 10. The Applicants have been unable to discern what the structure of the resulting combination of Melzner and Brandes that is envisioned by the Examiner in his rejections would look like.

The device in Melzner comprises a circular diaphragm that is under compressive stress such that it is in a "concave up" or "concave down" shape. Fig. 2D (below) shows a top view of four such diaphragms, while Fig. 2G (reproduced above) shows a side profile:

FIG 2D



Additionally, a "sharp point" contacts the diaphragm when the diaphragm is "concave up."

It is not clear which of these components could be substituted with a carbon nanotube. For example, if the sharp point was substituted with a carbon nanotube, then the invention as recited in the Applicants' claims would not be met. If the diaphragm in Melzner were replaced with a carbon nanotube, it is not clear if such a carbon nanotube should be fixed at one end, or at both ends, or how the carbon nanotubes could be placed under compressive strength, as Melzner teaches, such that the carbon nanotubes would be bistable, or how one or more nanotubes could otherwise be made to move into different positions to achieve the objects of Melzner. If the carbon nanotubes were fixed at only one end, it is not seen how bistability could be maintained. In addition, if carbon nanotubes were used instead of a diaphragm, it is not clear how alignment of the nanotubes with the sharp point would be accomplished. Given the nanoscopic dimensions of the carbon nanotubes, precise alignment of the nanotube with the sharp point from the lower substrate would be required, as even a slight difference would cause the carbon nanotube to completely miss the sharp point, resulting in a nonfunctional device. In Melzner, precise alignment is unnecessary due to the circular shape of the diaphragm. If more than one carbon nanotube were used in order to guarantee contact, it is not clear how all of the carbon nanotubes would each be fixed or manipulated such that the carbon nanotubes would all be "concave up" or

"concave down," i.e., such that the sharp point on the lower substrate would receive one signal, and not multiple or inconsistent signals from the multiple carbon nanotubes. In addition, Applicants do not see where Melzner teaches or suggests that multiple components would be useful in order to guarantee contact, which the Patent Office would be required to demonstrate. As noted, Melzner guarantees contact simply due to the circular shape of the diaphragm. If all of the components of Melzner were replaced with the carbon nanotubes of Brandes, then it is also not clear how the device would be made or used. Fig. 9B of Brandes is not helpful in regard; Applicants do not see how this figure, and its related description, is consistent with substitution in the bistable device of Melzner.

Thus, the Examiner has not indicated how Melzner and Brandes could actually be combined to form a workable device with a reasonable expectation of success. This rejection is therefore improper, as the Examiner must show a reasonable expectation of success that the combination can be formed. It is believed that such a combination would pose major difficulties, as discussed above, and thus, there would be no reasonable expectation of success.

CONCLUSION

Applicants respectfully request consideration of the above request and a favorable decision by the Panel. If there are any questions, the Panel is requested to call the undersigned at the telephone number listed below. If this request is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge Deposit Account No. 23/2825, under Order No. H0498.70112US01 from which the undersigned is authorized to draw.

Dated: 04/04/07

Respectfully submitted,

By _____

Timothy J. Oyer, Ph.D., Reg. No. 36,628
Tani Chen, Sc.D., Reg. No 52,728
WOLF, GREENFIELD & SACKS, P.C.
Federal Reserve Plaza
600 Atlantic Avenue
Boston, Massachusetts 02210-2206
(617) 646-8000